

CORE-LEVEL PHOTOABSORPTION CHARACTERIZATION OF DIAMOND AND CARBON FILMS L. J. Terminello, J. A. Carlisle, D. G. Sutherland, and S. Falabella, Lawrence Livermore National Laboratory, Livermore, CA 94550; C. D. Zuiker, A. R. Krauss, D. M. Gruen, Argonne National Laboratory, Argonne, IL 60439; I. Jimenez and D. K. Shuh, Lawrence Berkeley National Laboratory, Berkeley, CA 94720; F. J. Himpsel, University of Wisconsin, Madison, Madison, WI 53706

We have used synchrotron radiation core-level photoabsorption to characterize the electronic structure and morphology of carbon thin-films and determined the relative ratio of sp² vs. sp³ bonding. The diamond, diamond-like, and carbon films characterized were prepared by a variety of methods including sputtering, CVD, microwave plasma CVD, and laser ablation. We have also measured these films using Raman spectroscopy and have found that in cases where the domain size of the crystallites in the carbon films was nanoscopic (less than 100 nm), Raman spectroscopy gave indeterminate results. In these cases, as well as with larger crystallite size films, core-level photoabsorption was able to unambiguously identify the bonding in the film. We will present photoabsorption data obtained from these materials. These experiments and prospects for other experiments that can identify the unique electronic properties and bonding of such novel thin films will be discussed. This work was supported by the U. S. Department of Energy under Contract No. DE-AC03-76SF00098 for the Advanced Light Source, Lawrence Berkeley National Laboratory, contract number W-31-109-ENG-38 for Argonne National Laboratory, and under Contract No. W-7405-ENG-48 for the Lawrence Livermore National Laboratory.